

## Complete Summary

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### GUIDELINE TITLE

Physical activity in the prevention, treatment and rehabilitation of diseases.

### BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Physical activity in the prevention, treatment and rehabilitation of diseases. In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Jun 29 [Various].

### GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Physical activity in the prevention, treatment and rehabilitation of diseases. In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Apr 20 [Various].

## COMPLETE SUMMARY CONTENT

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## SCOPE

### DISEASE/CONDITION(S)

- Coronary heart disease (prevention and rehabilitation)
- Dyslipidemia
- Hypertension (prevention and treatment)
- Stroke (prevention and rehabilitation)
- Obliterating peripheral arterial disease (intermittent claudication) (treatment and rehabilitation)
- Obesity (prevention and treatment)
- Type 2 diabetes (prevention and treatment)
- Type 1 diabetes (prevention and treatment)

- Osteoporosis and osteoporotic fractures (prevention)
- Osteoarthritis of the lower limbs (prevention and treatment)
- Rheumatoid arthritis (treatment)
- Low back problems (prevention and rehabilitation)
- Asthma (treatment)
- Chronic obstructive pulmonary disease (COPD) (treatment)
- Symptoms of anxiety and depression (treatment)
- Sleep disturbance (treatment)
- Smoking (treatment for cessation)

## GUIDELINE CATEGORY

Prevention  
Rehabilitation  
Treatment

## CLINICAL SPECIALTY

Family Practice  
Internal Medicine  
Preventive Medicine

## INTENDED USERS

Health Care Providers  
Physicians

## GUIDELINE OBJECTIVE(S)

Evidence-Based Medicine Guidelines collects, summarizes, and updates the core clinical knowledge essential in general practice. The guidelines also describe the scientific evidence underlying the given recommendations.

## TARGET POPULATION

- General population of adults
- Men and women with (or at risk of) diseases that might benefit from physical activity

## INTERVENTIONS AND PRACTICES CONSIDERED

Physical Exercise, including:

1. Endurance training (aerobic exercise)
2. Resistance muscle training
3. Flexibility training

## MAJOR OUTCOMES CONSIDERED

- Functional and physical capacity and endurance
- Quality of life

- Changes in resting blood pressure
- Changes in blood lipids
- Overall and cardiac mortality
- Walking distance
- Changes in body weight
- Body composition (e.g., fat-free mass)
- Development of type II diabetes
- Bone mass
- Symptoms of depression
- Smoking cessation

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)  
 Hand-searches of Published Literature (Secondary Sources)  
 Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence reviewed was collected from the Cochrane database of systematic reviews and the Database of Abstracts of Reviews of Effectiveness (DARE). In addition, the Cochrane Library and medical journals were searched specifically for original publications.

### NUMBER OF SOURCE DOCUMENTS

Not stated

### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

- Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
- Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
- Limited research-based evidence. At least one adequate scientific study.
- No research-based evidence. Expert panel evaluation of other information.

### METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses  
 Systematic Review

## DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

One published systematic review of 17 studies suggests that exercise promotion has the potential to be highly cost-effective in persons aged 45 and over. The guideline developers comment, however, that the analysis contained a number of quite uncertain assumptions, which limited the accuracy of the estimates.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

# RECOMMENDATIONS

## MAJOR RECOMMENDATIONS

The levels of evidence [A-D] supporting the recommendations are defined at the end of the "Major Recommendations" field.

### The Fundamentals of Physical Exercise

- The physiological effects of physical activity are most marked in those parts of the body that are used most during exercise (i.e., the muscles, joints, bones, energy metabolism, circulation, as well as hormonal and neural regulation).
- For the effects to persist, physical activity must be regular. The effects may persist when the duration and frequency of exercise is slightly reduced, particularly if the intensity remains the same.
- Physical activity is the best and most significant way of ensuring the maintenance of functional capacity. Physical activity is therefore especially important in the prevention of the detrimental effects of ageing and chronic illnesses.
- Excessive or incorrect exercise may cause functional disorders or sports injuries. The margin between suitable and excessive exercise (i.e. the therapeutic range of physical activity) may be narrow, particularly in those in poor health.

- The beneficial effects of endurance-type activity (aerobic exercise) to health and functional capacity have been studied the most. For endurance exercise to be beneficial, the intensity of the exercise in a healthy person needs to be at least 50%, preferably 60%, of the maximal aerobic power (maximal oxygen consumption,  $\text{VO}_{2\text{max}}$ ). This means that the person's heart rate during exercise should be approximately 60 to 75% of his/her maximum heart rate. This type of exercise, for example brisk walking, is considered to be moderately intense. To improve cardiovascular fitness (energy metabolism and circulation), physical activity needs to include rhythmic movements of the large muscle groups which should be sustained for a considerable length of time (usually several tens of minutes). Walking, cross-country skiing, cycling, and swimming are examples of endurance (stamina) building exercise. Less information is available regarding the health benefits of resistance training (weight training), which increases muscle strength (Pollock et al., 2000).
- Physical activity plays a significant role in the prevention of coronary heart disease and other atherosclerotic diseases, hypertension, type 2 diabetes, osteoporosis and osteoporotic fractures, as well as some types of cancer (colon cancer and possibly also breast cancer). (U.S. Department of Health and Human Services [DHHS], 1996). Exercise reduces the risk of all-cause mortality by approximately 10% and of cardiovascular diseases by 20%.

### Exercise Programmes

#### Cardiorespiratory (Aerobic) Fitness

- American College of Sports Medicine (ACSM), 1998.
- Moderate (intensity 50 to 85%  $\text{VO}_{2\text{max}}$  [the effect is more significant if the minimum intensity is 60%]) endurance training 3 to 5 times per week (see table below; Dunn, Andersen & Jakicic, 1998).

Table: American College of Sports Medicine Exercise Recommendation

Endurance Training to Improve and Maintain Cardiorespiratory Fitness and to Develop and Maintain Body Composition	Resistance Training to Improve and Maintain Muscular Fitness and Flexibility
3 to 5 times per week	8 to 10 exercises, 1 set, 2 to 3 times per week. Each exercise is repeated 8 to 12 times, older persons should repeat each exercise 10 to 15 times.
(55-) 65-90% of HRmax	Flexibility (maintenance of the range of movement) at least 2 to 3 times/week
(40-) 50-85% of the $\text{VO}_2$ reserve (or HR reserve)	
20-60 min of continuous or intermittent	

Endurance Training to Improve and Maintain Cardiorespiratory Fitness and to Develop and Maintain Body Composition	Resistance Training to Improve and Maintain Muscular Fitness and Flexibility
(composed of bouts of at least 10 min accumulated throughout the day) exercise	
<p>Large muscle groups (rhythmical, aerobic)</p> <ul style="list-style-type: none"> <li>• <math>VO_2</math> reserve = difference between maximal and resting oxygen consumption</li> <li>• HRmax = maximal heart rate</li> <li>• HR reserve = difference between maximal and resting heart rate</li> </ul>	

#### Health-related Physical Activity

- American College of Sports Medicine (ACSM) and Centers for Disease Control and Prevention (CDC), 1995 (Pate et al., 1995)
- Health-related physical activity refers to exercise with health benefits and which does not cause significant health problems. The intensity of such physical activity should be moderate, brisk walking being a typical example. When the intensity is kept moderate, possible disadvantages of exercise (sports injuries and cardiac events associated with insidious coronary heart disease) are avoided, particularly in those not accustomed to exercise.
- Recommendation: Every adult should engage in moderate-intensity physical activity for at least 30 minutes on most, preferably all, days of the week. Moderate intensity is defined as 40 to 60% of maximal oxygen consumption ( $VO_{2max}$ ). The 30-minute activity can also consist of shorter exercise bouts (minimum of 10 minutes) that are accumulated throughout the day (e.g., walking or cycling to work, shopping or running other errands). (Hardman, 2001)

#### Prevention of Coronary Heart Disease

- There is an inverse relationship between the occurrence of coronary heart disease and the amount of exercise taken, or aerobic fitness. (Murphy et al., 2002) [C] (Williams, "Physical fitness," 2001)
- Physical activity can have a beneficial effect on the major risk factors of coronary heart disease (hypertension, dyslipidaemias, obesity, insulin resistance), on factors affecting thrombosis formation, such as the function of the vascular endothelium, and possibly also on the electric stability of the heart. The most effective way of producing these effects is regular, frequent endurance training of moderate-intensity. In practice this means physical activity, such as brisk walking, for 30 to 60 minutes on most days.

## Prevention and Treatment of Hypertension

- Persons who take regular exercise have lower resting blood pressure than those who exercise only a little. (US Department of Health and Human Services, 1996). Endurance-type exercise lowers blood pressure on average by 4/3 mmHg (Halbert et al., 1997) [B]. The effect is less significant on ambulatory blood pressure (Kelley, 1996) [C] (Pescatello & Kulikowich, 2001). Resistance training may also lower hypertension to the same degree as endurance training (Kelley & Kelley, 2000).
- The exercise recommendation of ACSM (ACSM, 1993) for mildly or moderately elevated blood pressure:
  - 40-70% of  $VO_2$ max (i.e. 55 to 80% of the maximal heart rate). The lower range of intensity is sufficient for the elderly.
  - 3 or 4 times weekly for at least 30 minutes at a time
  - Various endurance exercise modes are suitable. Resistance training (preferably circuit training) should not be the only form of exercise but should be combined with endurance training.
- Training at an intensity of about 50% of the  $VO_2$ max (moderate-intensity) is sufficient with regard to resting blood pressure reduction (Fagard, 2001).
- There is little information regarding the effect of intermittent exercise (i.e. exercise bouts of less than 30 minutes' duration) on the resting blood pressure. The reduction in blood pressure may be similar to that seen during normal exercise of longer duration (Staffileno, Braun, & Rosenson, 2001).

## Effect of Physical Activity on Blood Lipids

- Moderate-intensity endurance training may increase the serum concentration of high-density lipoprotein (HDL)-cholesterol (approximately 5% from baseline) and decrease the concentration of low-density lipoprotein (LDL)-cholesterol (5%) as well as triglycerides (4%) in healthy, sedentary individuals (Halbert et al., 1999) [B].
- A high amount of moderate-intensity exercise over several months is needed in order to bring forth the beneficial effects on HDL-cholesterol concentration (Kraus et al., 2002). In practice this means brisk walking or similar exercise for 30 to 60 minutes almost daily.
- The effect of exercise on the LDL-cholesterol concentration is enhanced if the intake of saturated fats is reduced simultaneously. The above mentioned beneficial changes in the lipid profile may be further augmented with concurrent weight reduction (adipose tissue reduction) (Williams, "Health effects," 2001). Larger serum lipid changes are seen with the combination of low fat diet and exercise (Yu-Poth et al., 1999).
- Information regarding the effect of resistance training on the blood lipoproteins varies, and HDL-cholesterol concentration does not always increase. (Halbert et al., 1999). The reason for this could be the lower energy consumption associated with moderate-intensity resistance training as compared with aerobic training.

## Rehabilitation in Coronary Heart Disease

- Cardiac rehabilitation programmes should consist of a multifaceted and multidisciplinary approach, exercise training being one of the facets (Balady et al., 2000). Cardiac rehabilitation may reduce both all-cause and cardiac

mortality by around 20% (Jolliffe et al., 2002) [B]. Cardiac rehabilitation with emphasis on exercise training does not differ markedly from conventional rehabilitation as regards all-cause mortality.

- Recommendation (Fletcher et al., 1995)
  - Mainly endurance training
    - at an intensity of 50(-60)-75% of symptom-limited  $\text{VO}_2\text{max}$  (or heart rate reserve, which is the difference between maximal and resting heart rate) for 30 minutes 3 to 4 times weekly (minimum), full benefit is obtained with 5 to 6 times/week; and
  - Resistance training (Pollock et al., 2000).
    - at an intensity of 30 to 50% (up to 60 to 80%) of 1 RM (one repetition maximum), 12-15 repetitions, 1-3 sets twice weekly

### Other Atherosclerotic Diseases

#### Stroke

- Epidemiological research has shown that physical activity reduces the risk of stroke, and regular physical activity is one of the recommended methods of stroke prevention (Gorelick et al., 1999). Physical activity has an influence not only on atherosclerosis but also on other risk factors of stroke, such as hypertension, HDL cholesterol, insulin resistance, and blood coagulation factors. An exercise programme for the prevention of stroke is similar to the programme recommended for preventing coronary heart disease.
- In stroke rehabilitation, specific motor and physical exercises designed by professionals in neurology and physiotherapy are important in the correction of motor deficits.

#### Treatment and Rehabilitation of Obliterating Peripheral Arterial Disease (Intermittent Claudication)

- Regular physical activity may protect against intermittent claudication.
- In lower limb atherosclerosis, physical exercise lengthens the painless walking distance (Leng, Fowler, & Enrst, 2001) [B].
- In addition to smoking cessation, walking exercises up to the pain threshold several times per day form a central part of the treatment and of post-operative secondary prevention. Other types of exercise, such as resistance training, have not been shown to be clearly beneficial for symptom relief or for the functional capacity of the lower limbs.

### Prevention and Treatment of Obesity

- Management of obesity always requires permanent changes to the diet. It is important to distinguish between the phases of weight loss and weight maintenance. The general aim of weight maintenance is to prevent weight gain, particularly after successful weight reduction. It may be best to increase the amount of physical activity when actual weight reduction ends.
- Exercise alone (usually endurance-type) without a change of diet only reduces weight by a few kilograms (Wing, 1999; "Clinical Guidelines," 1998) [A]. Endurance training has a beneficial effect on body composition (amount of muscle tissue [i.e., fat-free mass (FFM)] increases and that of fat tissue



- decreases), even if actual weight loss is limited. During a weight reduction diet, resistance training preserves a few kilograms more of fat-free mass compared with endurance training (Garrow & Summerbell, 1995) [A].
- Exercise combined with a low-energy diet does not significantly improve weight reduction compared with diet alone; the additional weight loss is at the most only a few kilograms (Wing, 1999; "Clinical Guidelines," 1998; Miller, Koceja, & Hamilton, 1997; Ballor & Keeseey, 1991) [B].
  - Exercise (increased physical activity) combined with a low-energy diet may improve weight maintenance after weight loss, compared with diet alone (Wing, 1999; "Clinical Guidelines," 1998; Fogelholm & Kukkonen-Harjula, 2000) [C]. In intervention studies, the effects of exercise on weight have been rather modest compared with epidemiological follow-up studies in which increased physical activity appears to reduce weight gain (Wing, 1999).
  - In the prescribing of exercise, the aim has usually been a weekly increase in energy expenditure of 4.2 to 8.4 megajoules (MJ) (1,000 to 2,000 kcal), since adherence to a prescribed exercise programme is often difficult to achieve. To achieve successful weight maintenance, weekly energy expenditure of up to approximately 10.5 to 11.7 MJ (2,500 to 2,800 kcal) may be needed (Wing, 1999; Fogelholm & Kukkonen-Harjula, 2000). This amount of energy consumption translates to 60 to 90 minutes of moderate-intensity physical activity daily (if the intensity is higher, the duration may be decreased) (Saris et al., 2003). However, even small amounts of daily physical activity (lifestyle activity) have been shown to have health benefits (regardless of whether the person loses weight or not) particularly on the risk factors of coronary heart disease.

Refer to Table 2 titled "Total energy expenditure (kJ or kcal) of a person weighing 70 kg during one hour of different modes of exercise" in the original guideline document.

### Prevention and Treatment of Type 2 Diabetes

- A large amount of regular, moderate-intensity endurance training and ample lifestyle activity integrated into daily activities have a beneficial effect on the various components of the metabolic (insulin resistance) syndrome, such as obesity, hypertension, disturbance of lipid and glucose metabolism, and insulin resistance. Similar effects might possibly also be achieved with resistance training (Willey & Singh, 2003). Increased physical activity reduces the risk of atherosclerotic artery diseases and type 2 diabetes.
- Frequent (at least 3 times a week) endurance exercise with at least moderate intensity increases insulin sensitivity, decreases the plasma insulin concentration, and enhances glucose tolerance. Endurance and resistance training may improve diabetic control (glycosylated haemoglobin) but only have a slight effect on weight reduction (Boule et al., 2001).
- This type of exercise may prevent the development of type 2 diabetes. The benefits of exercise are most prominent in persons with the highest risk of developing diabetes, for example, those with impaired glucose tolerance (Tuomilehto et al., 2001; Knowler et al., 2002) [B].
- Physical activity reduces the risk of diabetic complications, such as coronary heart disease. On the other hand, the possibility or existence of any complications should be taken into account when prescribing exercise for

people with type 2 diabetes. The risk of exercise-induced hypoglycaemia is negligible, unless the patient uses oral antidiabetic drugs.

### Treatment of Type 1 Diabetes

- Regular, well-timed physical activity that has been adjusted according to insulin and nutrition intake can improve diabetic control. In addition, it has a beneficial effect on the risk factors of coronary heart disease and on life expectancy.
- Physical activity may, however, also impair diabetic control or cause hypoglycaemia. Hypoglycaemia can be prevented by consuming an extra amount of carbohydrates before exercise and by taking an additional 20 to 40 grams per one hour of exercise. Hypoglycaemia may also be prevented by reducing the insulin dose before exercise, by avoiding physical activity during the peak action of insulin and by using an injection site that is not in an area where exercise (muscle work induces increased circulation) would fasten its absorption.
- If the patient's blood insulin level is low before exercise, glucose uptake by the muscles will not increase, but the liver will produce large amounts of glucose. This may lead to hyperglycaemia. Vigorous activity may also induce delayed hypoglycaemia.
- A patient whose diabetes is well controlled can take part in almost any type of physical activity. However, diabetic complications, such as neuropathies, atherosclerosis, retinopathy, and poor recovery from infections, should be taken into account when planning an exercise programme.

### Prevention of Osteoporosis

- Peak bone mass increases in early childhood and adolescence and it can be increased with regular exercise (Vuori, 2001). The loss of bone mass becomes accelerated in menopausal women.
- Bone is strengthened when loading induces microscopic transient remodelling of its structure. The remodeling occurs only at the sites that are loaded.
- The mineral content of the bones is increased (or maintained) and the strength of the bone is improved by exercise that is varied, weight bearing and that requires at least moderate strength. The exercise should preferably include rapid, multidirectional movements and controlled impacts. Examples of such exercise modes are aerobics and other types of exercise which involve jumping, as well as rapid racket games, such as squash. The weaker the bones, the less loading is needed to influence their strength. For example, walking maintains the bone mineral content in the elderly.
- The loss of bone mass in postmenopausal women may be reduced by exercise. Aerobics as well as weight bearing and resistance training increase the bone density of the lumbar spine in postmenopausal women (Bonaiuti et al., 2004) [A]. Walking as such has an effect on the bone density of the femoral neck.
- Exercise also has a beneficial effect on the bone mass of premenopausal women.
- In men, exercise increases the bone mass at the femur, lumbar spine, and calcaneus (Kelly, Kelly, & Tran, 2000).
- Prevention of osteoporotic fractures

- The aim is to maintain adequate bone mass and, in addition, to preserve gait and balance to prevent falls (Carter, Kannus, & Khan, 2001).
- Versatile physical activity that maintains a broad range of muscle control, moderate loading, and strength as well as balance and agility, such as walking on uneven terrain, gymnastics, aerobics, dancing, and racket games, is recommended within the limits set by the individual's physical condition and exercise skills.

### Osteoarthritis of the Lower Limbs

- Normal daily activities probably provide sufficient loading for the joints. Prevention or reduction of excessive weight gain is probably beneficial in the prevention of osteoarthritis.
- Sudden overloading, incorrect joint loading during exercise, and various injuries predispose a person to osteoarthritis (Vuori, 2001).
- Individually designed exercise programmes implemented under the supervision of a health care professional are beneficial in terms of overall fitness, joint problems, and functional capacity. The programme should cover flexibility exercises and muscle strength training, as well as general endurance training ("Exercise prescription," 2001).
- Exercise reduces the pain and functional disturbance in osteoarthritis of the knee and hip (McCarthy & Oldham, 1999; DARE-20005145, 2002) [B] (Petrella, 2000; DARE-20002058, 2002) [B].

### Rheumatoid Arthritis

- Exercise (dynamic muscle work) improves muscle strength, joint flexibility, and cardiovascular fitness in rheumatoid arthritis, but evidence on its long-term effect on functional capacity is still uncertain (Van den Ende et al., 2001) [B]. Exercise does not have adverse effects on disease activity.

### Prevention and Rehabilitation of Low Back Problems

- Regular exercise may prevent low back problems (Vuori, 2001). So far no consensus has been established on the contents of an optimal exercise programme. However, it is essential to regularly use the muscles of the back, trunk, and lower extremities and to maintain the mobility of the back by moderate and varied physical activity. In the prevention of back problems the endurance of the muscles associated with the function of the back seems to be more important than their strength.
- Exercise is not particularly effective in the treatment of acute back problems (Vuori, 2001), but in the rehabilitation of chronic back problems a quick return to normal physical activity has been shown to be more beneficial than passive bed rest (van Tulder et al., 2001) [B].

### Asthma

- Endurance training improves the cardiovascular fitness of an asthmatic patient, but its long-term effects on lung function, overall health, and quality of life require further studies (Ram, Robinson, & Black, 2001) [C].

- In addition to traditional training programmes, interval exercises have been used as they may reduce exercise-induced asthma. Swimming (high air humidity) may cause less exercise-induced asthma than, for example, jogging.

### Chronic Obstructive Pulmonary Disease (COPD)

- In chronic obstructive pulmonary disease (COPD), physical exercise combined with conventional treatment improves functional capacity. Furthermore, exercise improves the quality of life, reduces dyspnoea, and allows better mastery of the disease.

### Mental Health

- Physical activity may reduce anxiety (Fox, 1999; Montgomery & Dennis, 2003). Both endurance and resistance training may improve mood and cognitive function in the elderly (Ethier et al., 1997; DARE-988818, 2001) [C].
- Physical exercise may reduce the symptoms of depression (Dunn, Trivedi, & O'Neal, 2001). It has not been established which mode of exercise is the most effective; however, it is important to prescribe exercise that the patient perceives as pleasant.

### Sleep

- Physical activity can have both acute and long-term beneficial effects on sleep (Kubitz et al., 1996; Montgomery & Dennis, 2003).
- Exercise can increase the duration of slow-wave sleep and total sleep time, and it is also related to a decrease in sleep onset latency and REM sleep. (Kubitz et al., 1996)

### Cessation of Smoking

- Exercise may increase the success of smoking cessation as a part of other withdrawal therapy (Ussher et al., 2001; Marcus et al., 1999) [C].

### Physical Activity Counselling by the Physician

- Advising patients about physical activity forms a part of overall health education with the aim to introduce lifestyle changes (Eden et al. "Does counseling by clinicians," 2002). Physical activity counselling also includes patient education regarding his/her illness (does the illness set limitations to the amount of exercise; will exercise pose an increased risk?). Physical activity counselling is often combined with dietary advice. Physical activity promotion is a broader concept and is analogous with health promotion.
- According to international studies, physical activity counselling provided by a general practitioner or another health care professional in primary care is effective in producing short-term changes in physical activity, but adherence to the change is difficult (Eakin, Glasgow, & Riley, 2000) [A]. Advice should be individualised, and goals and monitoring should be agreed with the patient (Estabrooks, Glasgow, & Dzewaltowski, 2003).

- Exercise carried out at home might be more successful than exercise in special sports facilities (Hillsdon & Thorogood, 1996) [C]. This also emphasises the many possibilities of exercise incorporated into daily activities (lifestyle activity).
- Physical activity programmes have also been introduced at worksites, often integrated in activities to maintain and improve working capacity (Proper et al., 2002).

### Related Evidence

- Exercise-based cardiac rehabilitation reduces cardiac deaths and possibly also total mortality (Jolliffe et al., 2002) [B].
- Exercise promotion has the potential to be highly cost-effective in persons aged 45 and over (Nicholl, Coleman, & Brazier, 1994; DARE-940055, 1999) [B].
- Exercise training significantly improves maximum oxygen consumption in older people (Green & Crouse, 1995; DARE-965383, 1999) [B].
- Treatment including exercise for elderly reduces the risk of falls (Province et al., 1995; DARE-954030, 1999) [B].
- There is some evidence that aerobic exercise has beneficial effects on patients with osteoarthritis of the knee (La Mantia & Marks, 1995; DARE-945024, 1999) [C].
- There is some evidence that different forms of exercise may be beneficial for cognitive performance (Ethier et al., 1997; DARE-988818, 2001) [C].
- Home-based interventions may have some efficacy in promoting physical activity (Hillsdon & Thorogood, 1996) [C].
- Well-controlled physical activity interventions are effective in producing short-term changes in physical activity, but prolonged change or maintenance remains difficult (Eakin, Glasgow, & Riley, 2000) [A].
- Counselling appears to increase physical activity in sedentary people (Thorogood, Hillsdon, & Summerbell, 2002) [B].
- Counselling in general practice on exercise is effective in increasing physical activity and improving quality of life over 12 months (Elley et al., 2003; Eden et al. "Clinical counseling," 2002; Health Technology Assessment Database: HTA-20031108, 2004) [B].
- Progressive resistive exercise alone or in combination with aerobic exercise appear to be safe and may be beneficial for adults living with human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) (O'Brien et al., 2004) [C].

### Definitions:

#### Levels of Evidence

- Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
- Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
- Limited research-based evidence. At least one adequate scientific study.
- No research-based evidence. Expert panel evaluation of other information.

#### CLINICAL ALGORITHM(S)

None provided

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Concise summaries of scientific evidence attached to the individual guidelines are the unique feature of the Evidence-Based Medicine Guidelines. The evidence summaries allow the clinician to judge how well-founded the treatment recommendations are. The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

Appropriate use of physical activity for the prevention, treatment, and rehabilitation of diseases

### POTENTIAL HARMS

- Excessive or incorrect exercise may cause functional disorders or sports injuries. The margin between suitable and excessive exercise (i.e., the therapeutic range of physical activity) may be narrow, particularly for those in poor health.
- Physical activity may impair diabetic control in patients with type 1 diabetes or cause hypoglycaemia. If the patient's blood insulin level is low before exercise, glucose uptake by the muscles will not increase, but the liver will produce large amounts of glucose. This may lead to hyperglycaemia. Vigorous activity may also induce delayed hypoglycaemia
- Sudden overloading and incorrect joint loading during exercise predispose to osteoarthritis.

### Subgroups Most Likely to Be Harmed

- The margin between suitable and excessive exercise (i.e., the therapeutic range of physical activity) may be narrow, particularly in those in poor health
- Patients with type 1 diabetes are at higher risk for developing hypoglycaemia or hyperglycaemia from physical activity.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Staying Healthy

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Physical activity in the prevention, treatment and rehabilitation of diseases. In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Jun 29 [Various].

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2002 May 7 (revised 2004 Jun 29)

### GUIDELINE DEVELOPER(S)

Finnish Medical Society Duodecim - Professional Association

### SOURCE(S) OF FUNDING

Finnish Medical Society Duodecim

### GUIDELINE COMMITTEE

Editorial Team of EBM Guidelines

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary Authors: Ilkka Vuori, Katriina Kukkonen-Harjula

### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Physical activity in the prevention, treatment and rehabilitation of diseases. In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Apr 20 [Various].

## GUIDELINE AVAILABILITY

This guideline is included in a CD-ROM titled "EBM Guidelines. Evidence-Based Medicine" available from Duodecim Medical Publications, Ltd, PO Box 713, 00101 Helsinki, Finland; e-mail: [info@ebm-guidelines.com](mailto:info@ebm-guidelines.com); Web site: [www.ebm-guidelines.com](http://www.ebm-guidelines.com).

## AVAILABILITY OF COMPANION DOCUMENTS

None available

## PATIENT RESOURCES

None available

## NGC STATUS

This summary was completed by ECRI on December 17, 2002. The information was verified by the guideline developer as of February 7, 2003. This summary was updated by ECRI on June 30, 2004, and again on February 17, 2005.

## COPYRIGHT STATEMENT

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